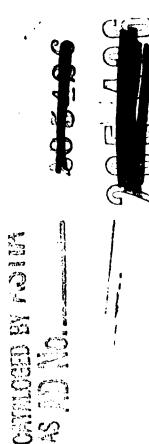63 – 3 – 4

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Final Report
to

Air Force Office of Scientific Research
Contract AF 49 (638)-801

Quantum Field Theory and Elementary Particles

January 1, 1960 - August 31, 1962

Submitted by

A.O. Barut
Project Director

The nature and the results of the research carried on during the past 33 months under the above contract can best be seen from the list of publications attached. We shall briefly stress the more important results:

(1) Our ideas about the role of resonances in strong interactions and dispersion relations, expressed in the original proposal have proved to be correct and contributed to the understanding of resonances in strong interactions. (Papers 3,8,9,11 and 2).

(2) The S Matrix Theory has been formulated in an invariant fashion which made it possible to treat scattering of particles with arbitrary spins and isospins and their analytical continuation uniformly (Papers 16, 24)

(3) The recent hypothesis about the complex angular momentum poles (the so called Regge poles) of the relativistic S Matrix has been investigated and properties of these poles determined. Complex Angular Momentum has been extended to the scattering of particles with arbitrary spins. (Papers 10, 17, 20, 21, 24)

● (4) The two components higher order spinor equations have been quantized for the first time predicting 'neutrinos' for each fermian (Papers 18 and 19).

Other research include the investigation of strange particles and hyperfragments (Papers 7, 12, 13, 14, 15, 22, 23, 25) and work on electrodynamics and weak interactions (1, 4, 5, 6)

During the period of the contract three graduate students have received their Ph.D. They are George Mullen, Keiser Ruei and William Zeleny. Two others, E. Branscomb and J. Dilley, are working towards Ph.D. Two research associates Dr. S. Iwao and Dr. B. Unal have worked on the project. During the last part of the contract we had the opportunity to work in close collaboration with many physicists at Berkeley, California, which has been very valuable.

-2-

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17. A. O. Barut and D. E. Zwanziger, Complex Angular Momentum in Relativistic S. Matrix Theory, Phys. Rev. (Aug. 1, 1962).

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